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*Indian Standard*  
CODE OF PRACTICE FOR CONSTRUCTION  
OF FLUE-CURING TOBACCO BARNs  
( *First Revision* )

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**INDIAN STANDARDS INSTITUTION**  
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# *Indian Standard*

## CODE OF PRACTICE FOR CONSTRUCTION OF FLUE-CURING TOBACCO BARNs

### ( *First Revision* )

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# *Indian Standard*

## CODE OF PRACTICE FOR CONSTRUCTION OF FLUE-CURING TOBACCO BARNs

### ( *First Revision* )

#### 0. FOREWORD

**0.1** This Indian Standard ( First Revision ) was adopted by the Indian Standards Institution on 28 February 1985, after the draft finalized by the Tobacco and Tobacco Products Sectional Committee had been approved by the Agricultural and Food Products Division Council.

**0.2** Curing is an important aspect in the production of flue-cured tobacco and plays a vital role in determining the quality of the finished product. For achieving this, the barns should be so constructed as to ensure efficient control over the temperature and humidity in the barn. The main considerations prompting this revision are fuel economy and saving in time of loading and curing.

**0.3** This Indian Standard was first published in 1967. With the proven advantages of the low-profile barns over the traditional barns, this revision is prepared.

**0.4** For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

#### 1. SCOPE

**1.1** This standard specifies the method of construction and other related requirements of flue-curing tobacco barns.

**1.2** This standard does not cover the details regarding furnaces used in the barns.

#### 2. LOCATION

**2.1** The barn shall be located on raised and well-drained site, not liable to flooding and inundation. In choosing the site of the barn, the direction of the normally prevailing winds and proximity of trees shall be taken into account.

**2.2** The barns shall be located at a place operationally convenient to the farmers.

**2.3** The location of the ancillary structures in relation to the barns shall be such as to serve as good wind breakers.

#### 3. TYPES

**3.1** There shall be two types: (a) Type A ( suitable to Karnataka ), and (b) Type B ( suitable to Andhra Pradesh and Gujarat ).

This differentiation was necessitated to suit the varying local conditions and preferences.

#### 4. DIMENSIONS

**4.1** The dimensions of the two barns shall be as follows:

a) Type A:  $7.32 \times 4.88 \times 3.96$  m

b) Type B:  $7.32 \times 4.88 \times 3.20$  m

**4.2** As the leaf size tends to be larger in areas like Northern light soils ( NLS ) where topping of the crop is advocated, the height of the barn has to be increased such that the distance between consecutive tiers is 60 cm instead of the normal 45 cm. In such cases the height of the walls up to gable will be 3.65 m instead of 3.2 m.

#### 5. FOUNDATION

**5.0** The depth of foundation of the barn shall depend on the soil type and region where the barn is located.

**5.1** Foundation should be at least 1.14 m deep for Type A barn and 1.37 m deep for Type B barn. The earth work excavation is to be marked correct to the dimensions depending on the type of the barn so that the final measurements after excavation are as follows:

Type A :  $1.14 \times 0.76$  m

Type B :  $1.37 \times 0.99$  m

## 5.2 Basement

**5.2.1 Type A** — A bed concrete of 0.23 m thick (1 : 4 : 8) has to be laid well rammed and cured at least for 3 days before commencement of further work. Basement construction shall be carried out with sized red stones with red earth up to 0.91 m and height up to ground level maintaining a width of 0.61 m. The basement above the ground level shall have the dimensions of 0.53 m width and 0.61 m height, and shall have cement mortar pointing on both sides ( Fig. 1 ).

**5.2.2 Type B** — Packing with boulder stones up to a height of 0.46 m with 50 percent gravel shall be done followed by watering and ramming. As a second layer, cement concrete ( 1 : 5 : 10 ) is to be laid up to a height of 0.3 m, well rammed and cured for at least 3 days before commencing further work. This is followed by brickwork in foundation in two footings each of 0.3 m height in cement mortar ( 1 : 6 ) and packed filling of the trenches up to ground level ( Fig. 2 ).

## 5.3 Plinth Slab and Lintels

**5.3.1 Type A** — 0.13 mm thick RCC ( 1 : 4 : 4 ) band is to be provided at the basement level. Lintels

with outstone slabs over doors, windows and ventilators may be used in place of RCC lintels.

**5.3.2 Type B** — 0.15 m thick RCC band at base level and 0.10 m thick RCC band at lintel level will increase the stability of the structure. The required number of RCC lintels over windows, doors and ventilators should be well cured at least for 10 days before commencement of further work.

## 6. FLOOR

**6.1** The floor of both the types of barn shall be *kutchra* or mudflooring with earth filling up to the required level.

## 7. WALLS

**7.1 Type A** — Walls of 0.36 m thickness are to be constructed with burnt brick in red earth up to a height of 3.96 m at the eve ends and 5.64 m at the gable ends leaving holes for fixing the wooden poles of the tiers. The walls are plastered with red earth inside and with cement mortar ( 1 : 6 ) outside.

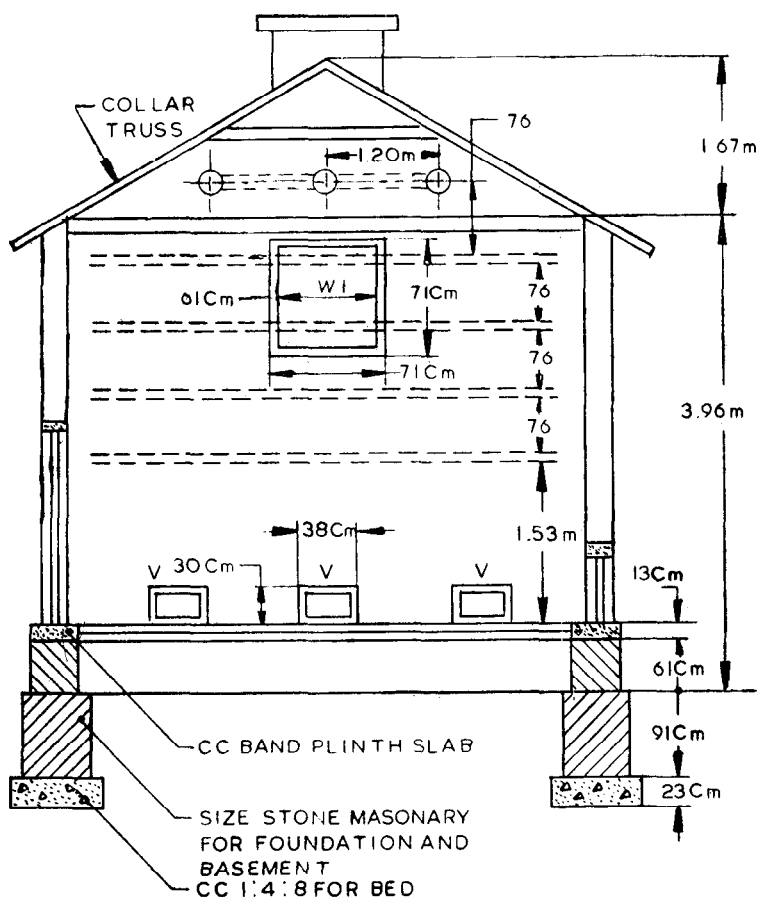


FIG. 1 CROSS SECTION WITH STRUCTURAL DETAILS ( KARNATAKA BARN )

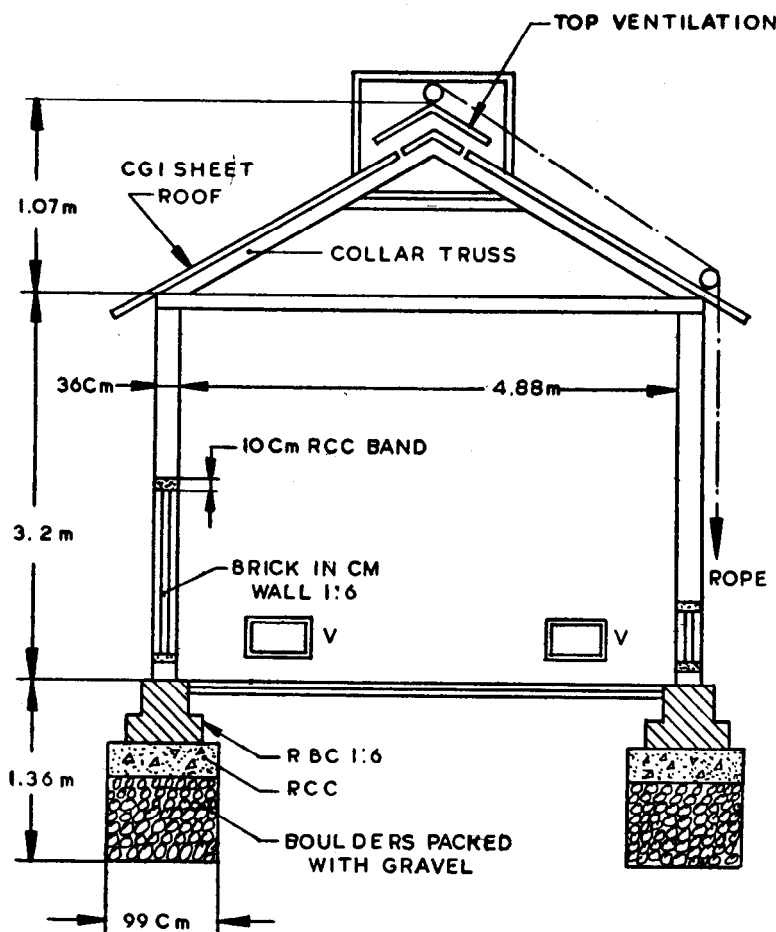


FIG. 2 CROSS SECTION WITH STRUCTURAL DETAILS ( ANDHRA BARN )

**7.2 Type B** — Walls of 0.36 m thick are to be constructed with burnt brick with cement mortar (1 : 6) to a height of 3.2 m at the eave ends and 4.27 m at the gable ends leaving holes for fixing the wooden poles of the tiers. The walls have to be well-watered and cured.

## 8. ROOF

**8.1 Type A** — The roof is laid with Mangalore tiles which are pointed with cement lime mortar composite mixture. Roof frame is to be made of wooden collar trusses, wall plates, rafters, reapers, etc, in the usual way.

**8.2 Type B** — The roof is made of G.I. sheet (0.56 mm thickness) on country wood collar trusses, rafters, wall plates, reapers, etc, in the usual way.

## 9. DOORS

**9.1 Type A and Type B** — One door (double shutter type) of size 1.83 × 0.91 m openable to outside is to be erected on plinth slab. The shutters are covered with G.I. sheets (see Fig. 3 and 4).

## 10. OBSERVATION WINDOWS

**10.1** There shall be two types of observation windows, one meant for inspecting the leaves during curing and the other meant for observing the temperature and humidity inside the barn periodically by means of a curometer.

**10.1.1 Type A and Type B** — There shall be three leaf observation windows of single shutter type openable outside for both the types of the barn. One of them ( $W_1 0.71 \times 0.71$  m) is situated on the BC side while the other two ( $W_2 0.99 \times 0.68$  m) are situated on the CD side. Both the windows are fully covered with G.I. sheet and fixed at a height of 3.1 m from plinth level (see Fig. 5, 6 and 7).

**10.1.2** The curometer window ( $T$ ) for both the types of barn is made of  $0.46 \times 0.46$  m wooden frame with fixed glass pane and is situated on side CD at a height of 1.5 m from the ground level (see Fig. 6).



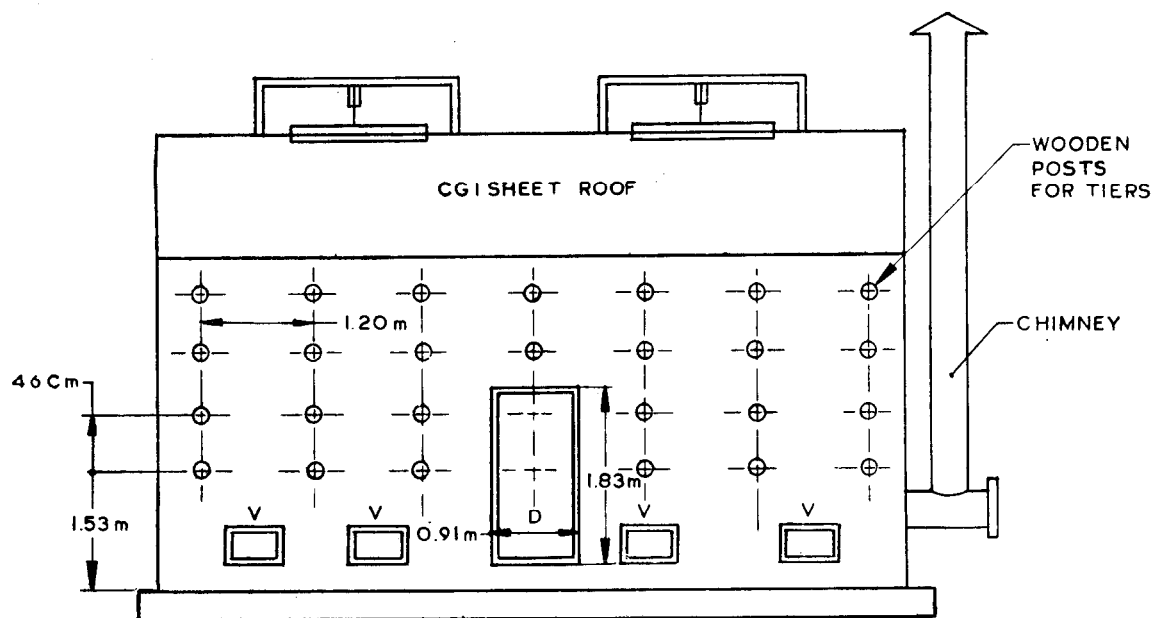


FIG. 3 SIDE ELEVATION ON AB SIDE ( KARNATAKA BARN )

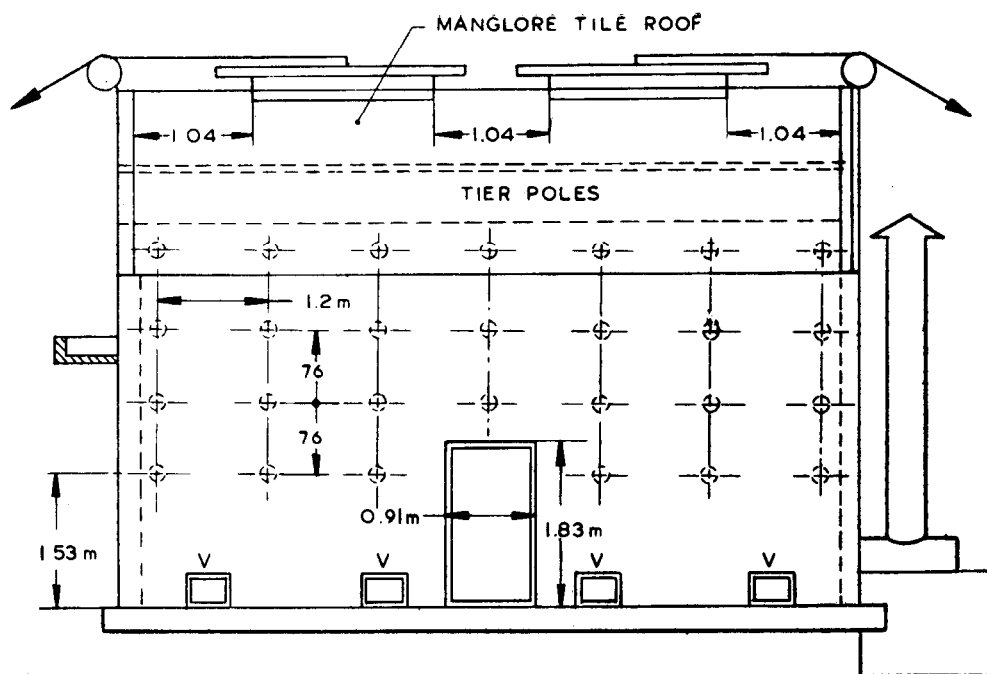


FIG. 4 SIDE ELEVATION ON AB SIDE ( ANDHRA BARN )

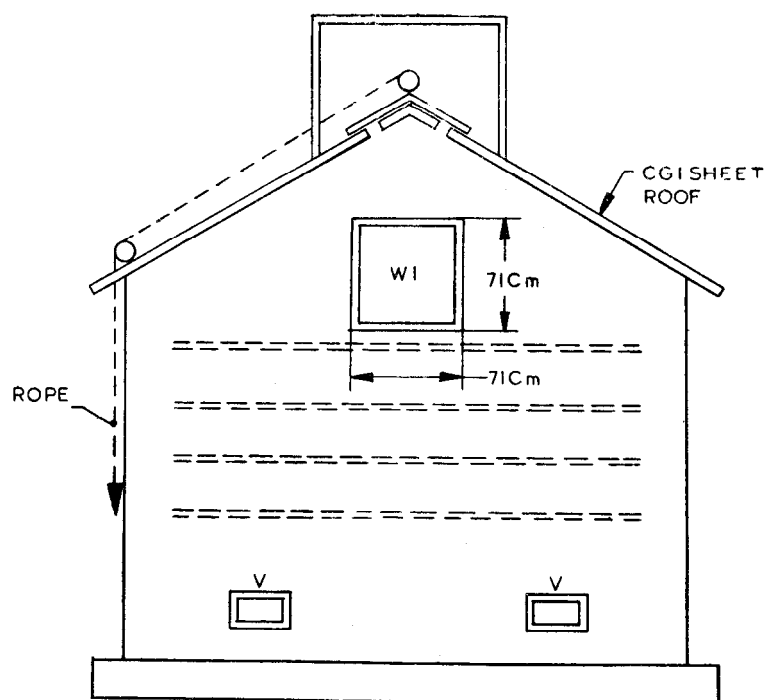


FIG. 5 SIDE ELEVATION ON BC SIDE ( ANDHRA BARN )

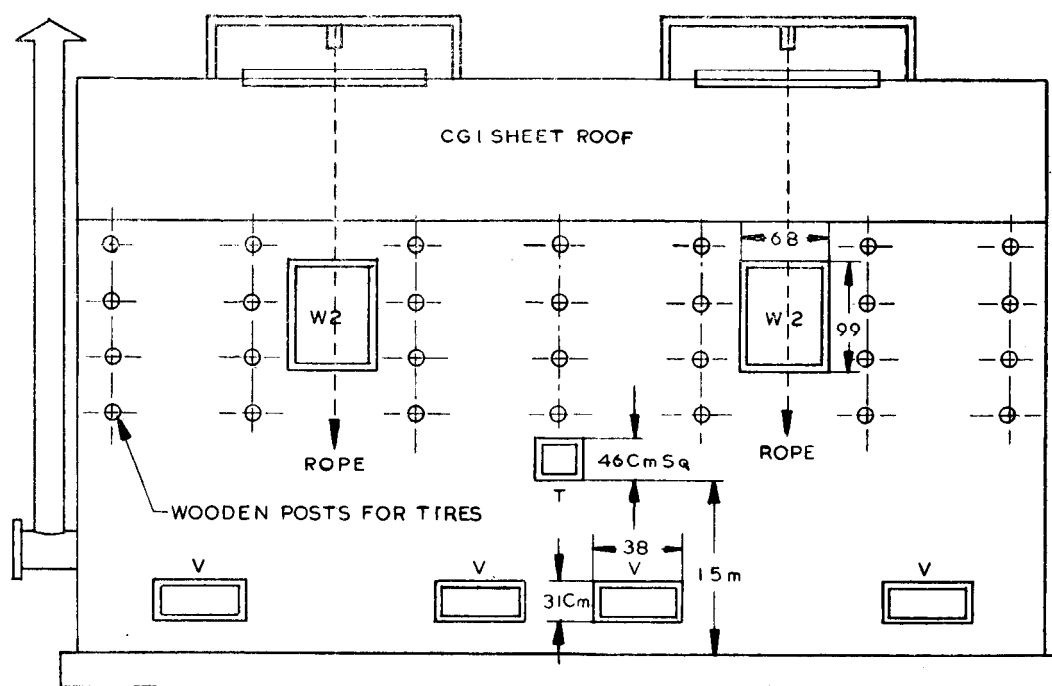


FIG. 6 SIDE ELEVATION ON CD SIDE ( ANDHRA BARN )

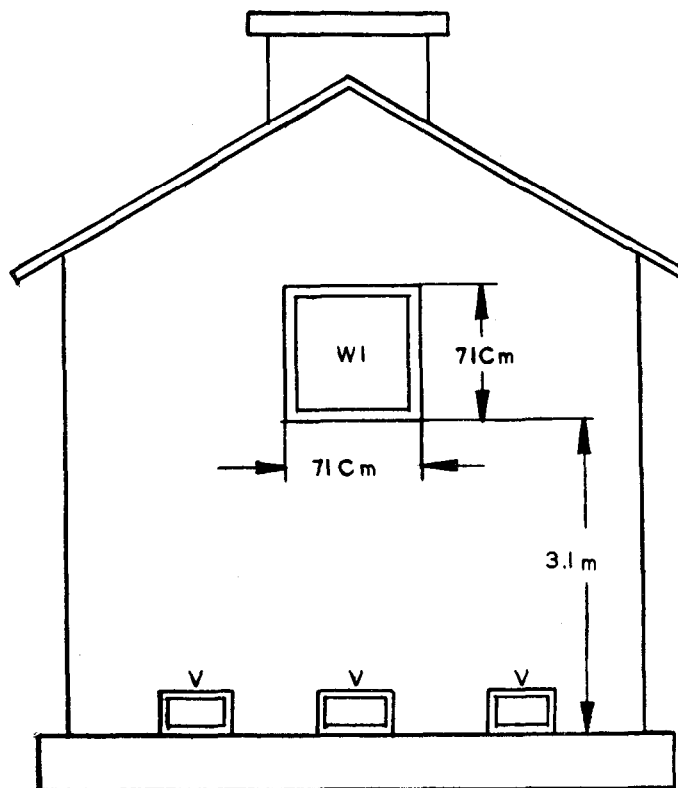


FIG. 7 SIDE ELEVATION ON BC SIDE ( KARNATAKA BARN )

**10.1.3** The curometer shall be in line with the observation window (*T*) and roughly located in the centre of the barn. The curometer will be drawn towards the window by means of a suitable pulley and rope arrangement for recording the inside temperature and humidity.

## 11. VENTILATORS

**11.1** The ventilators shall be constructed at the top and bottom of the barns.

### 11.1.1 Bottom Ventilators

*Type A* — They are of single shutter type ( $0.38 \times 0.31$  m) made of wooden frame and G.I. cover fixed with two hinges and openable outside vertically. The location of the bottom ventilators (*V*) is shown in Fig. 8.

*Type B* — Single shutter type ventilators made of wooden frame and G.I. cover ( $0.71 \times 0.30$  m) are to be fixed on the hinges at the top so as to become openable outside vertically. The location of the bottom ventilators (*V*) is shown in Fig. 9.

### 11.2 Top Ventilators

**11.2.1** *Type A* — There shall be two top ventilators of the box and shutter type. The box dimensions are  $2.13 \times 0.31$  m and the top shutter dimensions are  $2.59 \times 0.46$  m. The top shutter

opens sideways (Fig. 10). The shutters are opened and closed by sliding arrangement through three pivots and hooks made of 1.27 cm MS rods which are operatable from ground level by guide ropes passing through pulleys.

In order to protect from the outside cold winds entering into the barns, it is recommended to provide louvers above the top ventilators.

*Type B* — The two top ventilators (each 1.93 m long) with G.I. sheets as covers are arranged on the ridge so as to open or close by pulley and rope arrangement passing through the frame at the top (see Fig. 5).

## 12. ARRANGEMENT OF FLUES

**12.1** The arrangement of flues is the same in both the types of barn (see Fig. 8 and 9). The flue pipes shall be supported by brick pedestals and the height of the pipe from the ground level shall be 0.3 m (see Fig. 11 and 12). The spacing between wall and the flue should be not more than 22 cm.

**12.2** The flue pipes shall be made of mild steel sheet of minimum thickness of 0.56 mm. The diameter of the pipe shall be at least 300 mm.

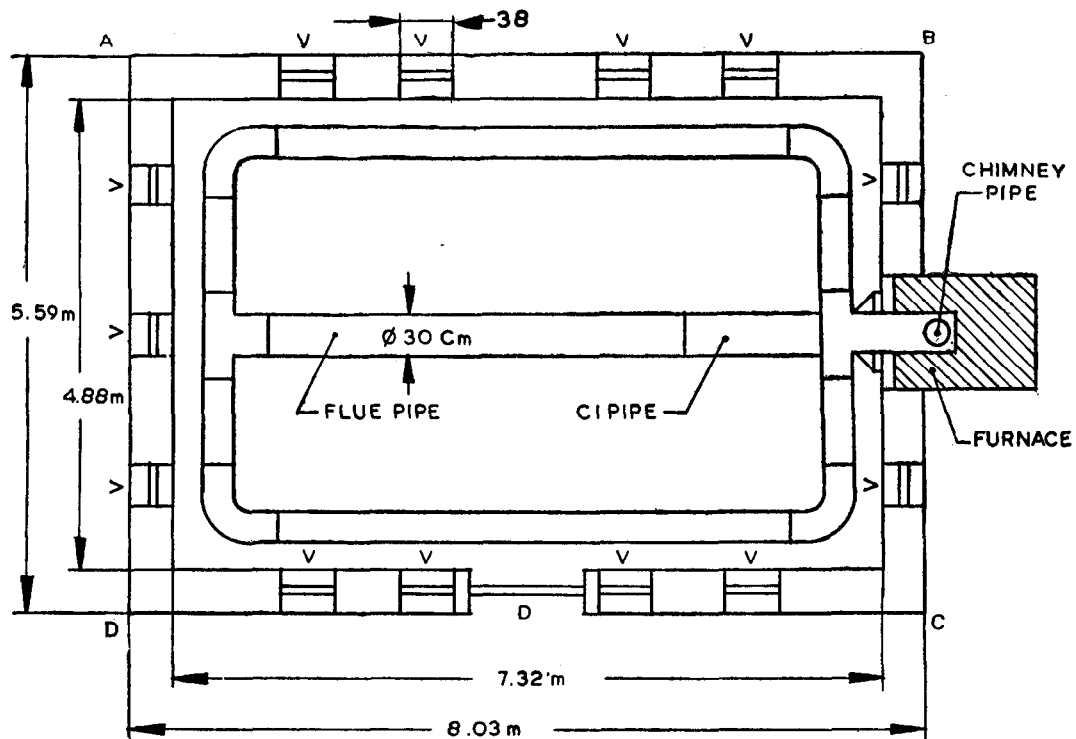


FIG. 8 GROUND PLAN WITH FLUE PIPE ARRANGEMENT ( KARNATAKA BARN )

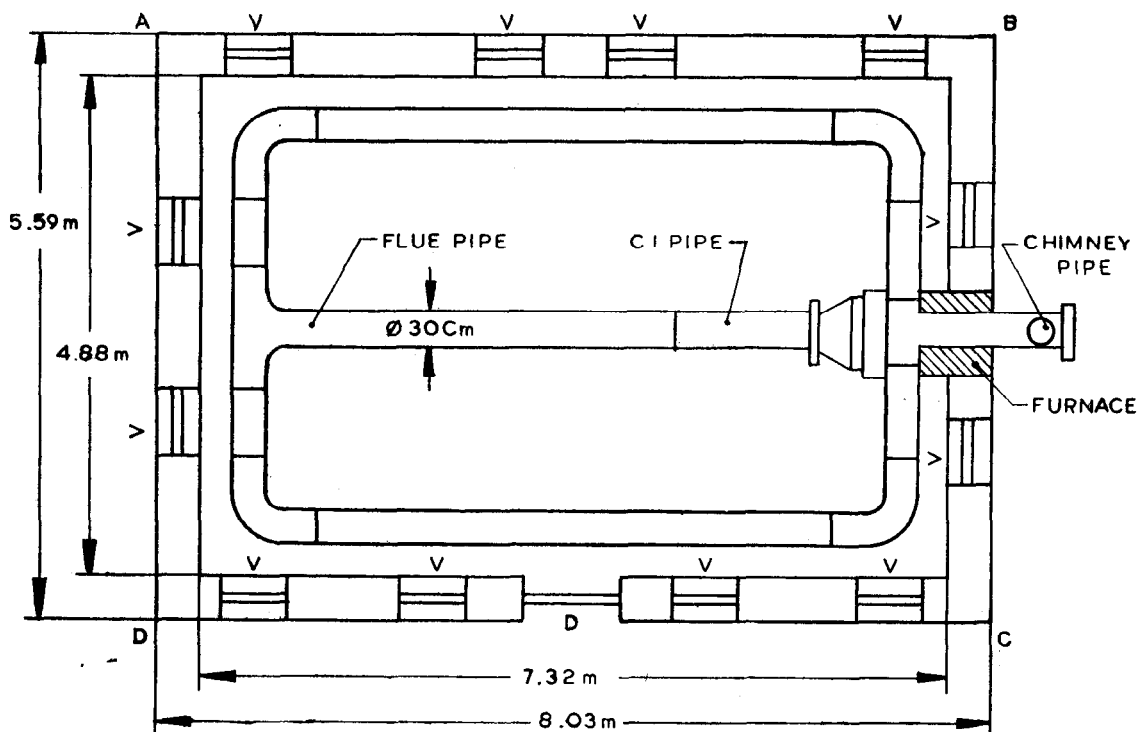


FIG. 9 GROUND PLAN WITH FLUE PIPE ARRANGEMENT ( ANDHRA BARN )

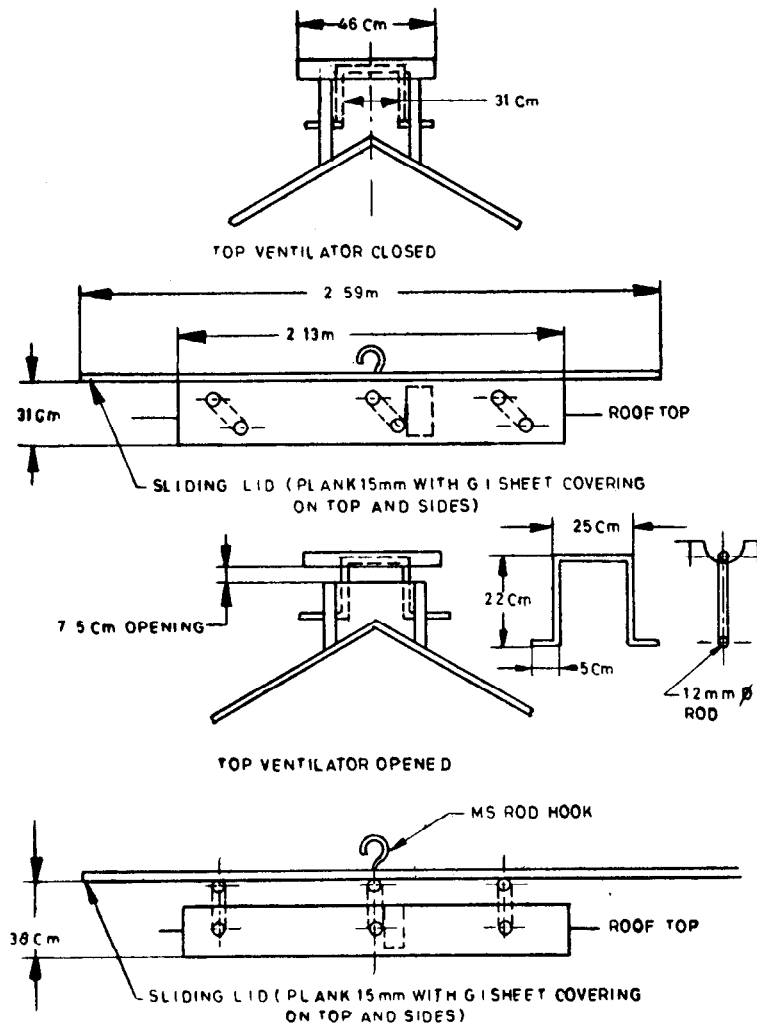


FIG. 10 TOP VENTILATORS IN OPERATION ( KARNATAKA BARN )

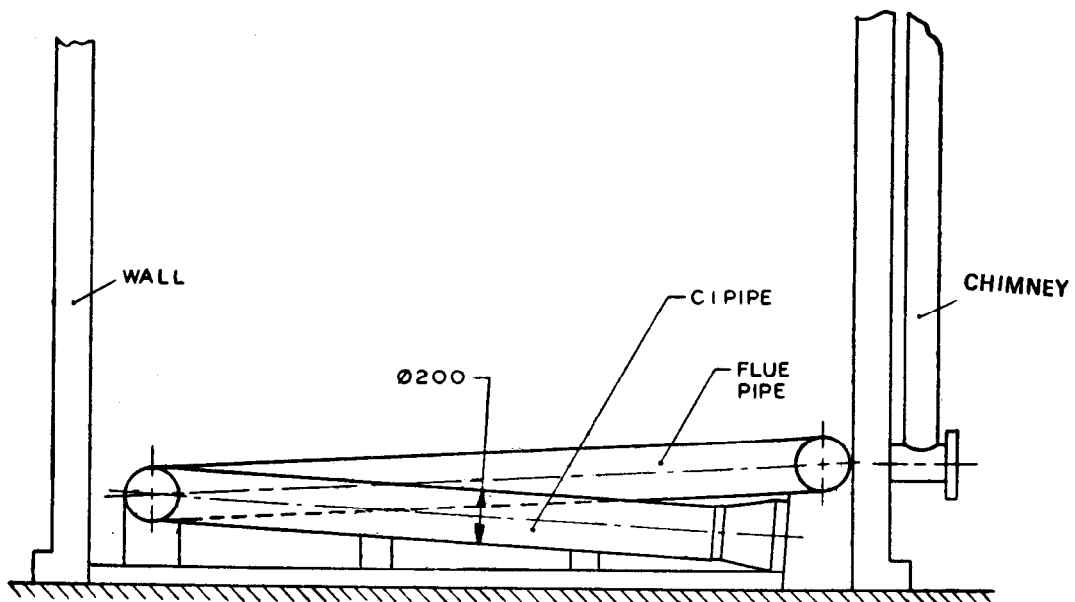


FIG. 11 SIDE VIEW OF FLUES ( KARNATAKA BARN )

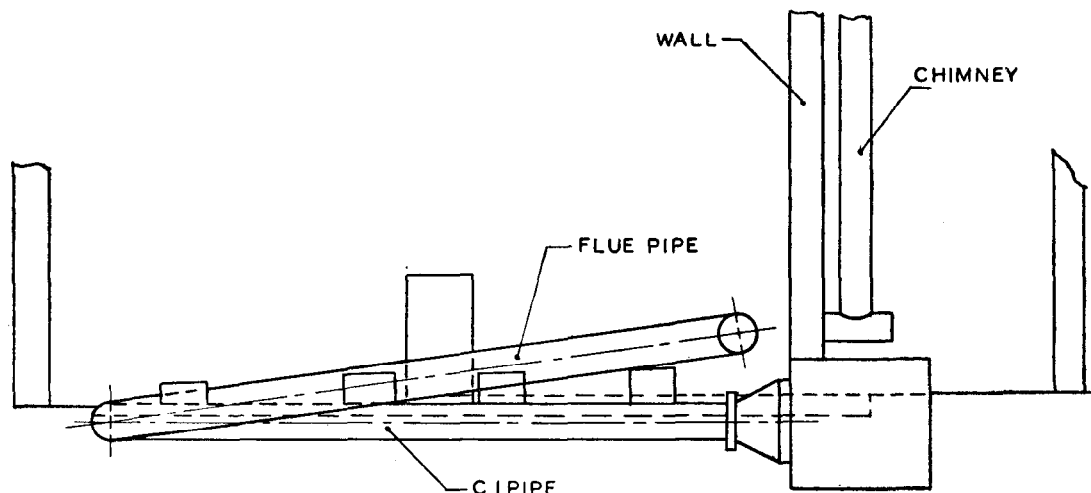


FIG. 12 SIDE VIEW OF FLUES ( ANDHRA BARN )

### 13. CHIMNEY

**13.1** The chimney pipe shall be made of the same material as used for the flue pipes and the diameter shall be 200 mm. It shall be fixed at a height of 0.30 m above level of the furnace. The height of the chimney shall be slightly higher than the height of the roof in order to prevent the smoke from entering into the barn through top ventilators ( see Fig. 13 and 14 ).

### 14. TIERS

**14.1 Type A** — The vertical distance of the bottom tier from the floor of the barn shall be 1.53 m and the other tiers are spaced at 0.76 m vertically and 1.2 m horizontally ( see Fig. 4 ).

**14.2 Type B** — The vertical distance of the bottom tier from the floor of the barn shall be 1.53 m and the other tiers are spaced at 0.46 m vertically and 1.20 m horizontally ( see Fig. 3 ).

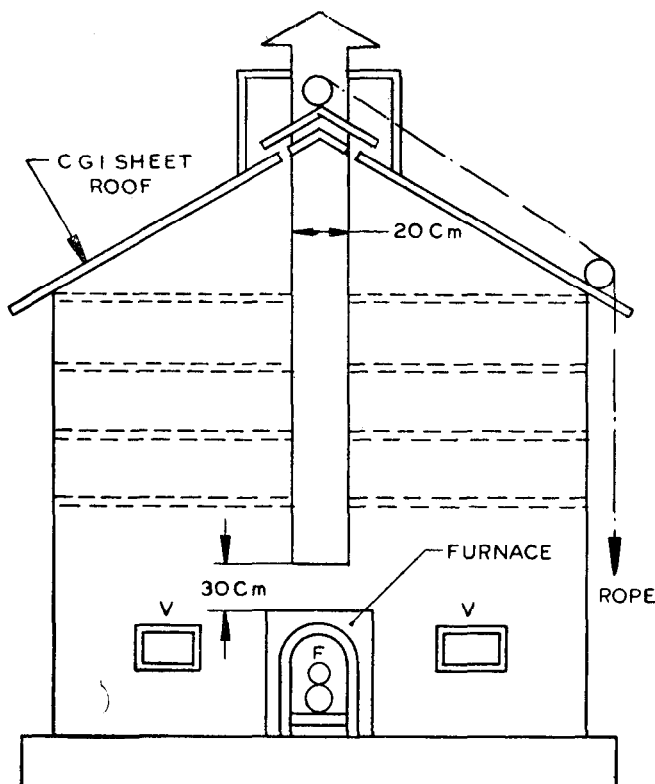


FIG. 13 SIDE ELEVATION ON AD SIDE ( KARNATAKA BARN )

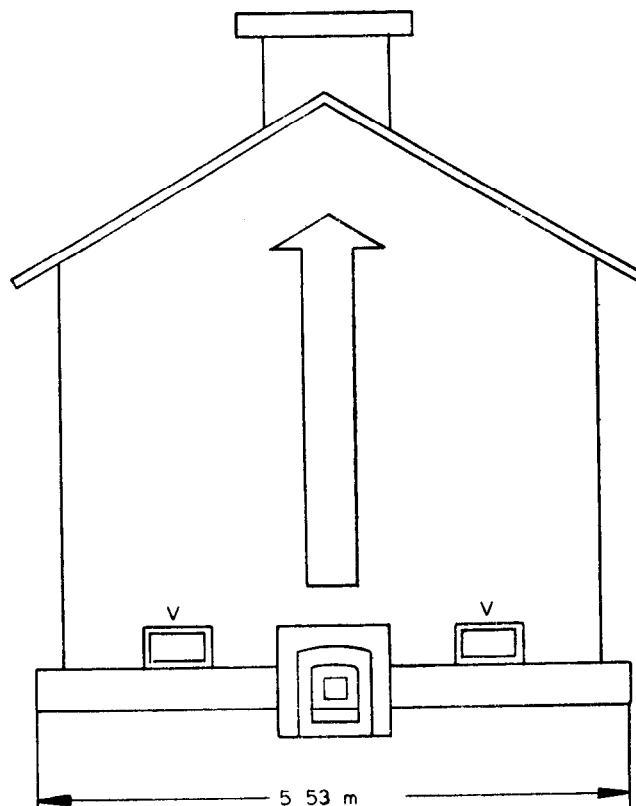


FIG. 14 SIDE ELEVATION ON AD SIDE ( ANDHRA BARN )

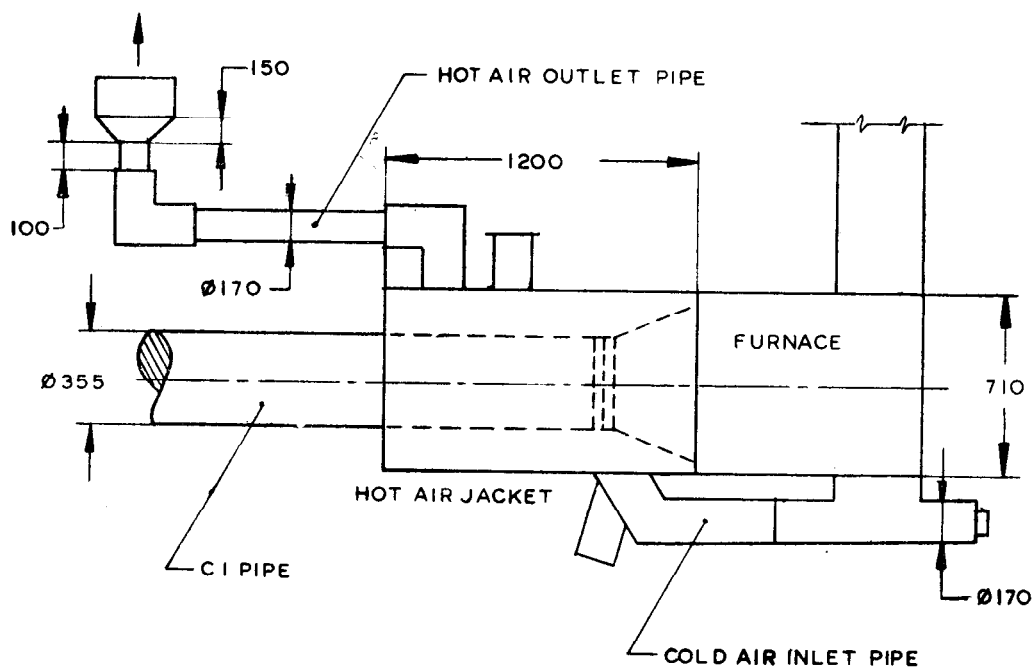
## 15. FURNACE

**15.1** The furnace shall be provided for heating the barns. The fuel used shall be either coal or wood ( see Fig. 13 and 14 ).

**15.2** A wire mesh shall be provided over the furnace and flue pipes at 0.6 m from the ground level to prevent fire hazards.

## 16. HEAT SAVING DEVICE

**16.1** As a heat saving device jacket ( see Fig. 15 ) may be attached to the furnace pipe in the barn. The jacket allows the outside cold air to enter the inside annular space where it gets heated and the preheated air will be let into the barn through the air vents located inside the barn.



All dimensions in millimetres.

FIG. 15 HOT AIR JACKET FOR CAST IRON PIPE



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